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ABSTRACT

HOW TO DESCRIBE THE INDIVIDUALLY PRESCRIBED INSTRUCTION (IPI) PLACEMENT TESTS TO THE NON-IPI COMMUNITY; HOW TO ASSESS STUDENT PERFORMANCE OVER A PERIOD OF TIME, AND WHAT INFORMATION CAN BE OBTAINED RELATIVE TO THE IPI CURRICULUM: SUCH ARE THE CONCERNS OF THIS STUDY. A POSSIBLE SOLUTION TO THE FIRST PROBLEM IS TO DESCRIBE THE IPI PLACEMENT TEST RESULTS IN TERMS OF THE IOWA TEST OF BASIC SKILLS (ITBS), FORM 4. HOWEVER, IT IS CONCLUDED, THIS AND THE OTHER SOLUTIONS PROPOSED FOR THE OTHER TWO PROBLEMS ARE NOT EXPECTED TO BE SATISFACTORY. HOLDING OUT MORE HOPE IS THE PROSPECT THAT THE ITBS DATA COUPLED WITH IPI PLACEMENT DATA CAN PROVIDE USEFUL INFORMATION FOR DESCRIPTIVE AND DECISION MAKING PURPOSES. (GO)

PROBLEMS ASSOCIATED WITH RELATING NORMATIVE AND SKILL TESTS

Sanford Temkin
Research for Better Schools, Inc.

(Talk given at University of Pittsburgh on November 3, 1967 to the Pennsylvania Educational Research Association.)

Research for Better Schools (RBS) has been involved in the field testing of the Individually Prescribed Instruction (IPI) Project which has been developed by the Learning Research and Development Center (LRDC) of the University of Pittsburgh. A part of our evaluation efforts has been focused on two different kinds of tests - the IPI Placement Test and the Iowa Test of Basic Skills (ITBS), Form 4.

Before moving into the main discussion it is necessary to examine the structure of these tests. The IPI Placement Tests are given to each child in the program. This program is built around a set of behaviorally defined objectives. The placement testing is designed to contain a sampling of items which will predict performance on these objectives. The test is divided by Level (B, C, ..., G). Each of these Levels contains sub-tests of the various Mathematics Areas which comprise the IPI curriculum.* The Placement Test generates, as an output, a Placement Profile

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* These Mathematics Areas are: Numeration, Place Value, Addition, Subtraction, Multiplication, Division, Combination of Processes, Fractions, Money, Time, Systems of Measurement, Geometry, Special Topics, and Supplementary Topics.

which is a set of very gross starting levels. This allows the teacher to start the child at those points in the continuum "where he is".*

The ITBS is an achievement test, although the test does have sub-tests which have gross "skill" outputs (e.g. Spelling, Punctuation). This test was selected because of its wide usage. It was also felt that this test had "more in common" with the IPI curriculum than any of the other widely used standardized tests. RBS decided to give four sub-tests of the ITBS battery. These are:

Arithmetic Concepts

Arithmetic Problem Solving

Vocabulary

Reading

The arithmetic sub-tests were given on an untimed-ungraded basis - that is - each child (grades 3-6) started at the first item on the third grade test and worked as far as he was able. The Vocabulary and Reading Tests were given under the usual time and grade constraints.

With this much of an introduction we shall look at three kinds of specific problems:

Problem I: Description - i.e. How can the IPI Placement Test be described to the non-IPI community - how does it look, feel, taste?

Problem II: Pre-Post Comparisons - i.e. What differences, if any, can be seen after a short interval of time has elapsed?

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* Appendix A contains an example of a child's Placement Profile.

Problem III: Curriculum Comment - i.e. What information can be obtained relative to the IPI Curriculum?

Problem I: Description

If we were to describe pupil placement strictly in IPI terms, many interested persons would not have a framework which is satisfactory for purposes of appreciating pupil performance outcomes. If, however, we attempt to describe the IPI Placement Test results in terms of ITBS performances we may be able to assist the "outside" educational community. The following is one way to describe the initial performance of two groups of children (IPI and control) in terms of the two tests (IPI Placement and ITBS):

First let us look at some description of performances on the ITBS. It should be emphasized that the objective is description and not a basis for quantitative substitution into a mathematical model.

1. Consider each grade level as a population.
2. Consider the ITBS Reading Comprehension score as a basis of stratification (classification).
3. Compute the means and standard deviations by school and for all schools (IPI versus control). These calculations will treat each of the two ITBS arithmetic tests as a separate problem.

TABLE ... 1 ITBS ARITHMETIC CONCEPTS BY READING COMPREHENSION GROUP (Grade 3)

Reading Comprehension		SCHOOL AA	SCHOOL AB	SCHOOL . . .
High				
	$\bar{x}$			
	s'			
	n			
Middle				
	$\bar{x}$			
	s'			
	n			
Low				
	$\bar{x}$			
	s'			
	n			
All Pupils				
	$\bar{x}$			
	s'			
	n			

This table provides a description of control and IPI schools for 3rd grade children performances on the ITBS. We will be able to determine the extent to which reading levels condition performance on a school by school basis in the ITBS Arithmetic Tests.

Now we can proceed to the IPI Placement Test description.

1. Consider each grade level as a population.
2. Consider each Mathematics Area (e.g. Numeration) as a separate problem.
3. Consider the ITBS Reading Comprehension score as a basis of stratification.
4. Compute the median ITBS score and the interquartile range for the particular grade level.
5. Relate the median performance on ITBS to the median performance on the IPI Placement Test. Try the same for the interquartile range.

Table #2 provides a description of the relationships between ITBS medians and the median placement in each Mathematics Area by school. Reading level is also taken into consideration.

TABLE ... 2 ITBS ARITHMETIC CONCEPT MEDIANS BY READING COMPREHENSION GROUP WITH IPI PLACEMENT MEDIANS (Grade 3)

	SCHOOL		
Reading Comprehension	AA	AB	. . .
High			
Median ITBS			
Median Placement			
Numeration			
Place Value			
Addition			
.			
.			
.			
Middle			
Median ITBS			
Median Placement			
Numeration			
Place Value			
Addition			
.			
.			
.			
Low			
Median ITBS			
Median Placement			
Numeration			
Place Value			
Addition			
.			
.			
.			
All Pupils			
Median ITBS			
Median Placement			
Numeration			
Place Value			
Addition			
.			
.			
.			

TABLE ... 3 IPI PLACEMENT LEVELS WITH MEDIAN ITBS ARITHMETIC SUB-TEST SCORES (Grade 3: Numeration)

IPI Level	Arithmetic (ITBS) Problem Solving (Median)	Arithmetic (ITBS) Concepts (Median)
B		
C		
D		
E		
F		
G		
H		

This information would add descriptive power in that it will show the relationship between the respective placement levels in IPI and the ITBS median scores.

Problem II: Pre-Post Comparisons

The pre-post problem focuses on the need to make assessments of pupil performance over time. The pre-test portions of both tests were given in September and October of 1967. There were substantial differences in the starting times as well as some reversals in the order of testing (we had indicated that the ITBS should be given immediately after the administration of IPI Placement Tests). A confounding factor is the length of exposure to the IPI Program. This varies from school to school and in some cases within school. A way to back out of this situation is to treat each school-grade combination as distinct. This makes for a "micro-analysis" and will detract from overall generalization power.

The first major question which needs to be answered is - did the IPI and control groups start out the same? For the sake of simplicity we can think of the third grade group for each school. Now we need a criterion. The simplest place to start is with the ITBS scores. The Analysis of Variance will indicate if we can treat all third grade groups as a single group with respect to averages. If not, we can create some sub-groups for subsequent analysis. Once these sub-groups have been structured we can proceed to an implicit question - how do these sub-groups compare on the IPI Placement Test? In this

instance we can use the chi-squared (χ^2) test. This procedure will generate four kinds of sub-groups.*.

1. Those with similar average pre-ITBS scores, only.
2. Those with similar frequency patterns on pre-IPI Placement Testing, only.
3. Those with similar levels of both of the above.
4. Those with none of the above: micro-analysis.

This leads us to the next major question in this pre-post framework - how did the respective sub-groups perform over time? The procedure to be employed for ITBS scores is a comparison of pre and post means within each sub-group. The nature of the sub-group composition (i.e. which of the above four sub-group types it belongs to) will determine the kinds of comparisons to be made. For example, a sub-group whose members have only similar pre-ITBS averages will be compared on a pre-post basis only with respect to ITBS averages. These school-grade combinations would be compared on a micro-analysis basis for IPI Placement pre-post comparisons.

Problem III: Curriculum Comment

When a test constructor sets out on his task, he tries out many more items than are ultimately used in the test. He discards those items which "everyone" gets as well as those items which "no one" gets. Perhaps the preceding is not totally relevant but it is fair to say that what actually happens is that the test measures, to a great extent, the curriculum

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* Assuming that the analysis of variance and the χ^2 tests have rejected the hypotheses of "no significant difference". Appendix B outlines the analytic flow of this section.

that the students were exposed to at the time of the test development. If another curriculum is designed with curriculum objective weights which differ substantially from "a standard weighted curriculum" then the students using the new curriculum may not do well on the existing test.*

This is not meant as an apology but rather it should provide a basis to ask some interesting questions. Suppose we look at a child's possible joint outcomes on the first item of ITBS and the first item of the IPI Placement Test.

		IPI Item #1	
		Right	Wrong
ITBS Item #1	Right		
	Wrong		

Now we can sum the number of tallies in the blocks over all children and we will obtain a pattern. If the pattern is random we are dealing with unrelated items. If the pattern is RIGHT-RIGHT, then "both curricula" handle these types of items. It is clear that what is needed is an analysis of the RIGHT-WRONG and WRONG-RIGHT combinations of items. The actual framework would appear as a large matrix ($N_{IPI} \times N_{ITBS}$), perhaps in terms of correlation coefficients. The analysis would presumably be best handled in the hands of curriculum experts.

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* For instance, an IPI child works on Geometry, Fractions, and Money skills at Level B (roughly first grade), and consequently would be penalized by tests which are fair to most curricula.

Concluding Comments:

It is fair to say that no solution to the three major problems discussed today will be totally satisfactory.. A group test cannot comment adequately on an individualized program; especially a program which is different in content as well as structure. Nevertheless, the problems are real and it is hoped that the ITBS data coupled with IPI Placement data can provide useful information for descriptive and decision making purposes.

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SCHOOL STAMP | P. 2-3

STUDENT NAME [redacted]

STUDENT NUMBER

P-4	5	6	7
0	-	-	1

MATHEMATICS

GRADE 5

P. 9

ROOM 5-17

KEYPUNCH SAMPLE			TO P. 78
P. 14-15	P. 16	P. 17-18	
MATH. AREA CODE	PLACED AT LEVEL	% OF PLACEMENT	
01	B	85	

MATHEMATICS AREA	DATE OF TEST	MATH AREA CODE		PLACEMENT LEVELS B—I								PLACED AT LEVEL
	P. 10-13			B	C	D	E	F	G	H	I	
NUMERATION	10/23	Ø1	MAX. PTS.	10	5							C
			SCORE	9	2							
			%	90	40							
PLACE VALUE		Ø2	MAX. PTS.	5	5							B
			SCORE	3	3							
			%	60	60							
ADDITION		Ø3	MAX. PTS.		10	5						D
			SCORE		9	2						
			%		90	40						
SUBTRACTION		Ø4	MAX. PTS.		10	5						D
			SCORE		10	2						
			%		100	-						
MULTIPLICATION		Ø5	MAX. PTS.			10						D
			SCORE			0						
			%			0						
DIVISION		Ø6	MAX. PTS.			10						D
			SCORE			0						
			%			0						
COMBINATION OF PROCESSES		Ø7	MAX. PTS.		5							C
			SCORE		3							
			%		60							
FRACTIONS		Ø8	MAX. PTS.	[illegible]	[illegible]							C
			SCORE	[illegible]	[illegible]							
			%	[illegible]	[illegible]							
MONEY		Ø9	MAX. PTS.	[illegible]	[illegible]	[illegible]						D
			SCORE	[illegible]	[illegible]	1						
			%	[illegible]	[illegible]	[illegible]						
TIME		1Ø	MAX. PTS.	1								B
			SCORE	1								
			%	1[illegible]								
SYSTEMS OF MEASUREMENT		11	MAX. PTS.	[illegible]	[illegible]	[illegible]						C
			SCORE	1	1	[illegible]						
			%	[illegible]	[illegible]	[illegible]						
GEOMETRY		12	MAX. PTS.	[illegible]	[illegible]							A
			SCORE	1	[illegible]							
			%		[illegible]							
ADDITION AND SUBTRACTION		34	MAX. PTS.									
			SCORE	1								
			%	[illegible]								

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APPENDIX B: Flow for answering the question: Did IPI and Control Groups Start Out Similar?